CLAIMS

- A process for producing linear alkyl benzene, the process including the steps of obtaining a hydrocarbon condensate containing olefins, paraffins and oxygenates from a low temperature Fischer-Tropsch reaction;
 - fractionating a desired carbon number distribution from the hydrocarbon condensate to form a fractionated hydrocarbon condensate stream;
 - extracting oxygenates from the fractionated hydrocarbon condensate stream from step (a) to form a stream containing olefins and paraffins;
 - c) combining the stream containing olefins and paraffins from step (b) with the feed stream from step (g) to form a combined stream;
 - alkylating olefins in the combined stream from step (c) with benzene in the presence of a suitable alkylation catalyst in an alkylation reactor;
 - e) recovering linear alkyl benzene from the alkylation reactor;
 - f) recovering unreacted paraffins from the alkylation reactor;
 - g) dehydrogenating the unreacted paraffins in the presence of a suitable dehydrogenation catalyst to form a feed stream containing olefins and paraffins; and
 - h) sending the feed stream containing olefins and paraffins from step (g) to step (c).
- 2. A process according to claim 1 wherein the low temperature Fischer-Tropsch reaction is carried in a slurry bed reactor at a temperature of 160°C - 280°C and in the presence of a cobalt catalyst to provide a hydrocarbon condensate containing 60 to 80% by weight paraffins and 10 to 30% by weight olefins.

- 3. The process according to claim 2, wherein the Fischer-Tropsch reaction is carried out at a temperature of 210°C 260°C.
- 4. The process according to any one of claims 1 3, wherein the Fischer-Tropsch reaction is carried out in the presence of a cobalt catalyst.
- 5. The process according to any one of claims 2 4, wherein the hydrocarbon condensate contains less than 25% by weight olefins.
- 6. The process according to claims 2 5, wherein the olefins in the hydrocarbon condensate have a linearity of greater than 92%.
- 7. The process according to claim 6, wherein the olefins in the hydrocarbon condensate have a linearity of greater than 95%.
- 8. The process according to any one of claims 1-7, wherein the paraffins in the hydrocarbon condensate have a linearity greater than 92%.
- 9. The process according to any one of claims 1-8, wherein the hydrocarbon condensate is fractionated, in step a), into the C_8 to C_{16} range.
- 10. The process according to claim 9, wherein the hydrocarbon condensate product is fractionated, in step a), into the C_{10} to C_{13} range.
- 11. The process according to claim 10, wherein the fractionated hydrocarbon product contains 10 to 30% by weight olefins with a degree of linearity greater than 92%.

- 12. The process according to any one of claims 1 11, wherein the oxygenates are extracted, in step (b), by distillation, dehydration or liquid-liquid extraction.
- 13. The process according to claim 12, wherein the oxygenates are extracted by liquid-liquid extraction.
- 14. The process according to claim 13, wherein a light solvent is used in the liquid-liquid extraction.
- 15. The process according to claim 14, wherein the light solvent is a mixture of methanol and water.
- 16. The process according to claim 15, wherein the oxygenate extraction process is a liquid-liquid extraction process that takes place in an extraction column using a mixture of methanol and water as the solvent, wherein an extract from the liquid-liquid extraction is sent to a solvent recovery column from which a tops product comprising methanol, olefins and paraffins is recycled to the extraction column, thereby enhancing the overall recovery of olefins and paraffins.
- 17. The process according to claim 16, wherein a bottoms product from the solvent recovery column is recycled to the extraction column.
- 18. The process according to any one of claims 15 17, wherein the solvent has a water content of more than 3% by weight.
- The process according to claim 18, wherein the solvent has a water content of from 5% - 15% by weight.
- 20. The process according to any one of claims 16 19, wherein a raffinate from the extraction column is sent to a stripper column from which a hydrocarbon feed stream containing more than 90% by

- weight olefins and paraffins and less than 0.2% by weight oxygenates exits as a bottoms product.
- 21. The process according to claim 20, wherein the hydrocarbon feed stream contains less than 0.02% by weight oxygenates.
- 22. The process according to any one of claims 1 21, wherein the recovery of olefins and paraffins in the hydrocarbon feed stream over the extraction step b) is in excess of 70%.
- 23. The process according to claim 22, wherein the recovery of olefins and paraffins in the hydrocarbon feed stream is in excess of 80%.
- 24. The process according to any one of claims 1 23, wherein the olefin/paraffin ratio of the fractionated hydrocarbon condensate stream a) is substantially preserved over the extraction step b).
- 25. The process according to any one of claims 1 24, wherein the dehydrogenation reaction at step (g) is carried out at a conversion rate of 10%-15%.
- 26. The process according claim 25, wherein the fractionated hydrocarbon condensate from step (b) has an olefin concentration of from 10% to 30% by weight, the feed stream from step (g) has an olefin concentration of 10% to 15% by weight, and the combined stream at step (c) has an olefin concentration of 12.5% to 22.5% by weight.
- 27. A fractionated hydrocarbon condensate product from a Fischer-Tropsch reaction, in the C₈ to C₁₆ range, containing olefins with a degree of linearity of greater than 92%, for use in a process for manufacturing linear alkyl benzene.

- 28. The fractionated hydrocarbon condensate product according to claim 27 in the C_{10} to C_{13} range.
- 29. The fractionated hydrocarbon condensate according to claim 27 or claim 28, wherein the olefins have a degree of linearity of greater than 95%.
- 30. A linear alkyl benzene product formed from the alkylation of olefins which are the product a Fischer-Tropsch reaction, wherein the linear alkyl benzene product has a degree of linearity of greater than 92%.
- 31. The linear alkyl benzene product according to claim 30, wherein the linear alkyl benzene product has a degree of linearity of greater than 93%.
- 32. A process of producing three hydrocarbon fractions from a hydrocarbon condensate and a wax fraction product stream from a Fischer-Tropsch reaction, the hydrocarbon fractions being:
 - hydrocarbon fraction A, being a hydrocarbon fraction having a boiling point above 25°C and an end point below 200°C;
 - hydrocarbon fraction B including at least a mixture of alkanes, alkenes and oxygenates having a boiling point in the range 100-300°C; and
 - 3) hydrocarbon fraction C having a boiling point in the range 120-400°C;

the method including the steps of:

- a) fractionating the hydrocarbon condensate stream, or a derivative thereof, from the Fischer-Tropsch reaction to form at least three fractionated hydrocarbon condensate streams wherein at least one of the three fractionated hydrocarbon condensate streams is hydrocarbon fraction B;
- b) hydroconverting at least the wax fraction product stream, or a derivative thereof, from the Fischer-Tropsch reaction;

- c) fractionating the hydroconverted wax product from step b) to obtain at least a hydroconverted light hydrocarbon stream and a hydroconverted distillate stream; and
- d) selectively blending the products of steps a) and c) to obtain hydrocarbon fractions A and C; and
- e) transferring the hydrocarbon condensate stream from step (a) that constitutes hydrocarbon fraction B to a process for the production of linear alkyl benzenes.
- 33. The process according to claim 32, including the additional step of transferring a waxy unconverted fraction from step b) to a process for the production of high viscosity index base oils by either solvent extraction or catalytic isodewaxing.
- 34. The process according to claim 32, wherein the Fischer-Tropsch reaction is a low temperature Fischer-Tropsch reaction carried out in a slurry bed reactor at a temperature of 160°C 280°C, and in the presence of a cobalt catalyst to provide a hydrocarbon condensate containing 60 to 80% by weight paraffins and 10 to 30% by weight olefins.
- 35. The process according to claim 34, wherein the low temperature Fischer-Tropsch reaction is carried out in a slurry bed reactor at a temperature of 210°C 260°C.
- 36. The process according to claim 35, wherein the hydrocarbon condensate contains less than 25% by weight olefins.
- 37. The process according to claim 32, wherein the hydrocarbon fraction A has a boiling point above 30°C and an end point below 175°C.
- 38. The process according to claim 37, wherein the hydrocarbon fraction A has an end point below 160°C.

- 39. The process according to claim 32, wherein the hydrocarbon fraction B has a boiling point in the range of 145°C 255°C.
- 40. The process according to claim 39, wherein the temperature range is 165°C 240°C.
- 41. The process according to claim 32, wherein the hydrocarbon fraction C has a boiling point in the range 150°C 380°C.
- 42. The process according to claim 41, wherein the hydrocarbon fraction C has a boiling point in the range of 160°C 360°C.
- 43. The process according to claim 32, wherein the process for the production of linear alkyl benzenes referred to in step e) comprises alkylation and catalytic dehydrogenation.
- 44. The process according to claim 32, wherein an additional hydrocarbon fraction is produced, the additional hydrocarbon fraction being hydrocarbon fraction D including medium to high molecular mass alkanes, both linear and isomerised, having a boiling point above 380°C.
- 45. The process according to claim 44, wherein the hydrocarbon fraction D includes medium to high molecular mass paraffins having a boiling point above 400°C.